

TABLE OF CONTENTS

C.2.2.1	Pollution Prevention/Sediment Mitigation	C-33
C.2.2.2	Collection System/Discharge Piping	C-33
C.2.2.3	Storage/Pre-Sedimentation	C-33
C.2.2.4	Treatment Components	C-34
C.2.3	Active Treatment System Sizing	C-38
C.2.3.1	Construction Area	C-38
C.2.3.1.1	Flowrate	C-38
C.2.3.1.2	Sedimentation Residence Time	C-38
C.2.4	Cost Estimating Approach	C-39
C.2.4.1	Construction Costs	C-39
C.2.4.2	Operational Costs	C-40
APPENDIX D: RELEVANT STORM WATER DOCUMENTS, WEB SITES, AND PROCESS SUMMARY FORMS		D
APPENDIX E: STORM WATER DATA REPORT AND CHECKLISTS		E
APPENDIX F: COST ESTIMATES		F
F.1	INTRODUCTION	F-1
F.2	OBJECTIVES	F-1
F.3	METHODOLOGY	F-1
F.3.1	Categories of Project Cost Estimates	F-1
F.3.2	Systematic Field Reviews	F-2
F.3.3	Technical Information	F-3
F.3.4	Use Groupings from Standard Cost Estimate Format	F-3
F.3.5	Contingencies Versus Confidence Factor	F-3
F.3.6	Construction Seasons	F-3
F.4	SUPPLEMENTAL WORK	F-4
F.5	STANDARD SPECIFICATIONS, CONTRACT PLANS AND SPECIAL PROVISIONS	F-4
F.6	ESTIMATING OPTIONS	F-4
F.6.1	Option 1: Percent of Total Cost Method	F-5
F.6.2	Option 2: Historical Project Method	F-7
F.6.3	Option 3, Unit Costs	F-8
F.6.4	Supplemental Costs	F-14
F.7	STANDARD FORMAT FOR PROJECT PLANNING COST ESTIMATES	F-15
F.7.1	Drainage	F-15
F.7.2	Specialty Items	F-16
F.7.3	Right-of-Way Items	F-16
F.7.4	Cost Estimate	F-16
APPENDIX G: ABBREVIATIONS, ACRONYMS, AND DEFINITION OF TERMS		G
G.1	ABBREVIATIONS	G-1
G.2	ACRONYMS	G-2
G.3	DEFINITION OF TERMS	G-7

TABLE OF CONTENTS

LIST OF FIGURES

Figure 1-1. Design Process Summary.....	1-3
Figure 2-1. Map of California with RWQCB and District Boundaries	2-5
Figure 2-2. Decision Process for Selecting Design Pollution Prevention BMPs.....	2-16
Figure 2-3. Decision Process for Selecting Treatment BMPs at Specific Sites.....	2-17
Figure 4-1. Project Evaluation Process for Consideration of Permanent Treatment BMPs	4-2
Figure 5-1. Project Initiation Document - Storm Water Task Categories	5-3
Figure 5-2. Flowchart for Consideration of Storm Water BMPs for the PID.....	5-6
Figure 6-1. Project Approval/Environmental Document - Storm Water Task Categories	6-3
Figure 6-2. Project Approval/Environmental Document – BMP Selection Process	6-6
Figure 7-1. Plans, Specifications, and Estimates Document - Storm Water Task Categories.....	7-2
Figure 7-2. BMP Design Process Flowchart	7-4
Figure A-1. Ditches, Berms, Dikes, and Swales.....	A-4
Figure A-2. Flared Culvert End Section	A-6
Figure A-3. Outlet Protection/Velocity Dissipation Device	A-7
Figure A-4. Slope Rounding, Stepping, Terracing, and Contouring	A-10
Figure A-4. Slope Rounding, Stepping, Terracing, and Contouring (Continued).....	A-11
Figure B-1. Schematic of an Infiltration Basin.....	B-7
Figure B-2. Schematic of an Infiltration Trench.....	B-8
Figure B-8. Schematic of Linear Radial Device.....	B-18
Figure B-9. Schematic of Linear Radial Device (HV)	B-19
Figure B-10. Linear Radial Device (partially full)	B-20
Figure B-11. Inclined Screen Device.....	B-21
Figure B-12. Caltrans Pilot Media Filters (Austin Sand Filter [left], Delaware Sand Filter [right])	B-24
Figure B-13. Schematic of a Austin Sand Filter - Full Sedimentation (Earthen Type).....	B-25
Figure B-14. Schematic of an Austin Sand Filter - Partial Sedimentation (Earthen Type).....	B-26
Figure B-15. Schematic of a Delaware Sand Filter	B-27
Figure B-15. Schematic of a Delaware Sand Filter (Continued).....	B-28
Figure B-16. Caltrans' MCTT pilot installations.....	B-30
Figure B-17. Schematic of an MCTT	B-31
Figure B-18. Schematic of a Wet Basin	B-33
Figure B-19. District 7 Infiltration Device Site Selection Logic Tree (Initial Site Screening)	B-37
Figure B-20. District 7 Infiltration Device Site Selection (Secondary Site Screening).....	B-38
Figure C-1. Active Treatment System Decision Tree.....	C-32
Figure C-2. Potential Treatment Schematic.....	C-34
Figure C-3. Sedimentation Tank (Devil's Slide).....	C-36
Figure C-4. Bag/Cartridge Filters (Devil's Slide)	C-37

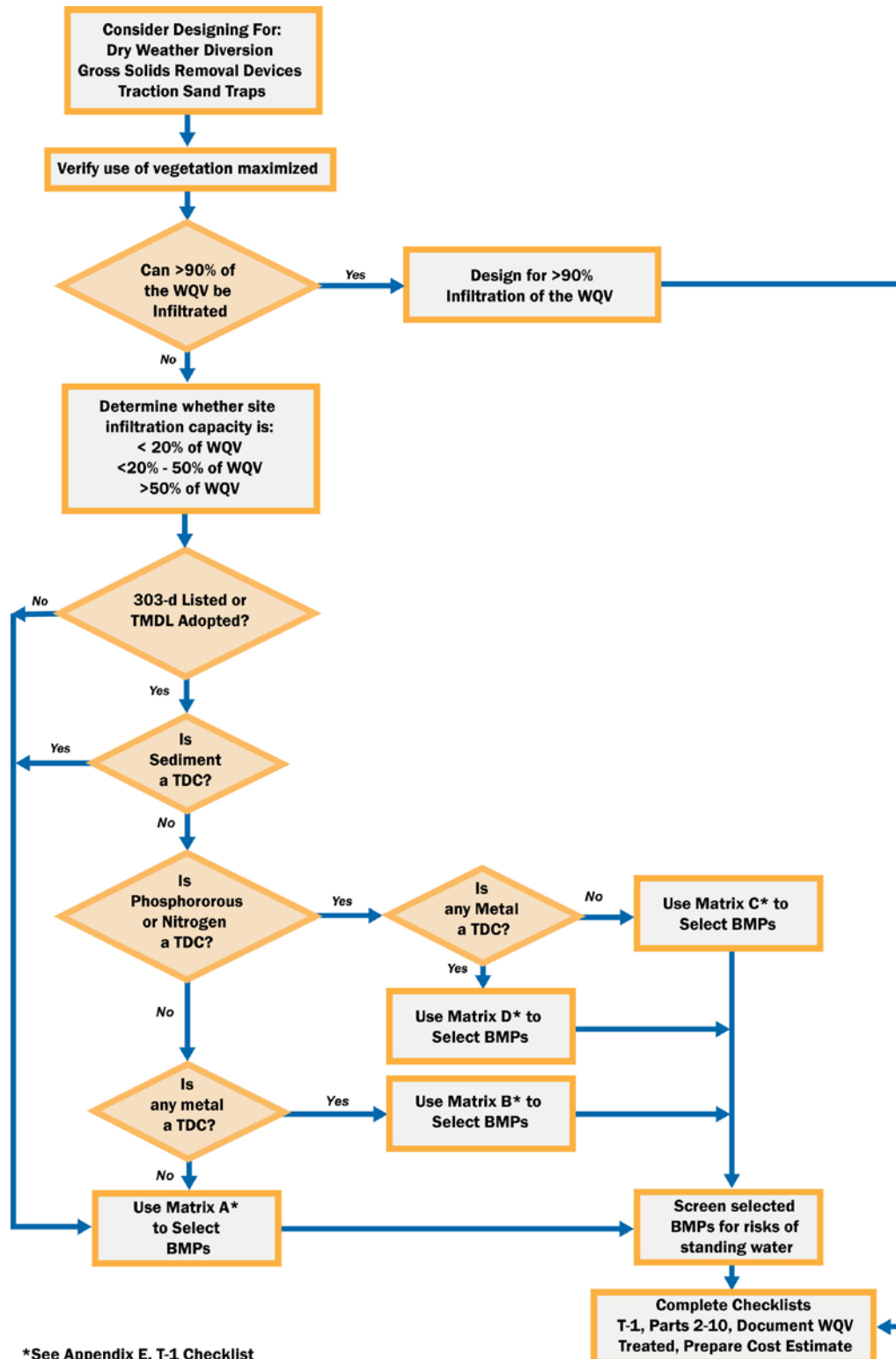


Figure 2-3. Decision Process for Selecting Treatment BMPs at Specific Sites

Biofiltration Strips and Swales are vegetated surfaces that remove pollutants by filtration through grass, sedimentation, sorption to soil or grass, and infiltration through the soil. Strips and swales are effective at removing debris, solid particles, and other pollutants through infiltration and by sorption to the soil. Biofiltration Swales are vegetated channels that receive directed flow and convey stormwater. Biofiltration Strips, also known as vegetated buffer strips, are vegetated sections of land over which stormwater flows as overland sheet flow.

Biofiltration Strips and Swales are to be implemented at all sites to the extent that implementation is consistent with existing Caltrans policies, as described herein. In practice, this means maximizing the use of vegetation in the right-of-way wherever site conditions and climate allow vegetation to establish and where flow velocities are not high enough to cause scour.

Infiltration Devices are basins or trenches that store runoff and allow it to infiltrate into the ground. Infiltration prevents pollutants in the captured runoff from reaching surface waters. In areas of high sediment loads, pretreatment may be required. Infiltration Devices are permanent Treatment BMPs, and should be considered wherever site conditions allow, and shall be sited and designed according to the criteria presented in Appendix B of this PPDG.

Detention Devices are basins or tanks that temporarily detain runoff under quiescent conditions to allow particles to settle out. A Detention Device is a permanent Treatment BMP designed to reduce the sediment and particulate loading in runoff from the Water Quality design storm.

Traction Sand Traps are sedimentation devices that temporarily detain runoff and allow traction sand that was previously applied to snowy or icy roads to settle out. Traction Sand Traps are permanent Treatment BMPs, and should be considered at sites where traction sand or other traction-enhancing substances are commonly applied (more than twice per year) to the roadway.

Dry Weather Flow Diversions are devices that direct flow through a pipe or channel to nearby municipal sanitary sewer systems for treatment at a local wastewater treatment plant during dry weather or during periods of dry weather. Dry Weather Flow Diversions may be feasible if dry weather flow from Caltrans activities is persistent, and the sanitary sewer authority is willing to accept the flow. They should only be considered if dry weather flow from Caltrans activities is persistent or the result of an ongoing Caltrans activity. Additionally, Dry Weather Flow Diversions should only be considered if connection to a nearby sanitary sewer would not involve excessive measures to implement.

Gross Solids Removal Devices (GSRDs) are devices that remove litter from stormwater runoff using various screening technologies. GSRDs should be considered for areas where receiving waters are on the 303(d) list for trash or areas for which TMDLs have been adopted that require trash removal.





Dist-County-Route: _____

Post Mile Limits: _____

Project Type: _____

Project ID (or EA): _____

Program Identification: _____

Phase: ☐ PID
☐ PA/ED
☐ PS&E

Regional Water Quality Control Board(s): _____

- | | | |
|---|------------------------------|-----------------------------|
| 1. Is the project required to consider incorporating Treatment BMPs? | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 2. Does the project disturb 5 or more acres of soil? | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 3. Does the project disturb more than 1 acre of soil and not qualify for the Rainfall Erosivity Waiver? | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 4. Does the project potentially create permanent water quality impacts? | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 5. Does the project require a notification of ADL reuse | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

If the answer to any of the preceding questions is "Yes", prepare a Long Form – Storm Water Data Report.

Estimate Construction Start Date: _____ Construction Completion Date: _____

Separate Dewatering Permit (if yes, permit number) Yes ☐ Permit # _____ No ☐Erosivity Waiver Yes ☐ Date: _____ No ☐

This Short Form – Storm Water Data Report has been prepared under the direction of the following Licensed Person. The Licensed Person attests to the technical information contained herein and the data upon which recommendations, conclusions, and decisions are based. Professional Engineer or Landscape Architect stamp required at PS&E.

 [Name), Registered Project Engineer/Landscape Architect Date

I have reviewed the stormwater quality design issues and find this report to be complete, current and accurate:

[Stamp Required for PS&E only]

 [Name), District/Regional SW Coordinator or Designee Date



1. Project Description

- Clearly describe the type of project and major engineering features, including a brief explanation why project does not have the potential to create water quality impacts.
- Quantify total disturbed soil area (DSA) and describe how it was calculated. Quantify added impervious areas (if any). It should be noted that projects that preserve, upkeep, and restore roadway structures do not need to include these activities within the calculation for DSA. When projects solely maintain the original line and grade, hydraulic capacity, and original purpose of the facility, then these projects are defined as routine maintenance and exempt from the DSA calculation and the Construction General Permit. Examples of such activities exempt from the DSA calculation are as follows:
 - Placement of shoulder backing material onto existing shoulder backing material.
 - Scarifying of existing shoulder backing material.
 - Re-grading or placement of gravel at existing maintenance access roads.
 - Grinding and grooving of roadway surfaces, including “cold planning” of asphalt surfaces.
 - Replacement of Portland Cement Concrete (PCC) slabs.
 - Highway planting without mass grading.
- Provide any additional information that may be pertinent to the project (e.g. TMDLs, Drinking Water Reservoirs and/or Recharge Facilities, 303(d) water bodies, 401 certifications, ASBS, etc.).

2. Construction Site BMPs

- A WPCP is typically used, unless written direction from the RWQCB requires a SWPPP. Identify if Rainfall Erosivity Waiver was used to eliminate need for SWPPP.
- Identify project risk level and document required monitoring, if applicable.
- Coordinate with Construction to determine the appropriate selection of Construction Site BMPs being implemented into the contract documents (e.g. separate line items and/or lump sum).
- Summarize those Construction Site BMPs been designated as separate Bid Line Items.
- Describe any pertinent details from the strategy used for estimating Construction Site BMPs.
- Document coordination effort to get concurrence from Construction regarding the Construction Site BMP strategy and associated quantities (provide names of staff and date of meeting(s)).

3. Required Attachments¹

- Vicinity Map
- Evaluation Documentation Form
- Construction Site BMP Consideration Form (required at PS&E only)
- Risk Level Determination Documentation, if applicable.
- Rainfall Erosivity Waiver, if applicable (required at PS&E)

¹ Additional attachments may be required as applicable or directed by the District/Regional Design Storm Water Coordinator (e.g. BMP line item estimate, DPP, CS checklists, etc).

- Describe RWQCB special requirements/concerns, including TMDLs or effluent limits
- Describe local agency requirements/concerns
- Describe project design considerations (climate, soil, topography, geology, groundwater, right-of-way requirements, slope stabilization, etc.)
- Include soil classifications (HSG) and geology information, if pertinent
- Describe project risk level determination and identify project risk level
- Identify if project involves reuse of soil containing Aerially Deposited Lead (ADL)
- Identify Right-of-way costs for BMPs
- Describe measures for avoiding or reducing potential stormwater impacts
- Identify any existing Treatment BMPs within the project limits and their association with the project

3. Regional Water Quality Control Board Agreements

The District/Regional NPDES coordinator will furnish information and language for this part of the Checklist.

- Summarize any key negotiated understandings or agreements with RWQCB pertaining to this project. This would include any discussions relating to 401 Certifications, Waste Discharge Requirements, Rainfall Erosivity Waiver, or other required permits/certifications.
- Document any specific meeting dates and contact names that reference the negotiated understandings and/or agreements. (Communication with the RWQCB is coordinated through the District/Regional NPDES Storm Water Coordinator.)

4. Proposed Design Pollution Prevention BMPs to be used on the Project.

Summarize responses to Checklist DPP-1, Parts 1-5 in a short narrative. Use the sub-headings shown below for the type of information that should be described in the narrative. Note, not all of the bulleted information listed is required or available at each phase of a project. Information to be included will depend on the nature of the project and the site conditions. To comply with the CGP (II.D), sediment yield and site stabilization be described in the permanent erosion control strategy, such that the site will not pose any additional risk than pre-construction conditions.

Summarize any qualitative benefits of Design Pollution Prevention BMPs including reducing the release of pollutants to downstream waters, increased detention time to allow for infiltration, reduced discharges (volumetric flow rates), and ancillary filtration and infiltration within vegetated conveyances and surfaces, as described in Section 2.4.1.

Develop an estimate of quantities and costs for the erosion control/revegetation portion of the Design Pollution Prevention BMPs as part of the Storm Water BMP Cost Summary; include right-of-way costs if additional right-of-way is needed for erosion control. Complete for each phase of the project.

Downstream Effects Related to Potentially Increased Flow, Checklist DPP-1, Parts 1 and 2

- Identify any increase to velocity or volume of downstream flow
- Describe Existing vs. Post Construction Conditions
- Describe channel condition and design (e.g., will the project discharge to unlined channels)
- Describe potential for increased sediment loading
- Identify hydraulic changes that may affect downstream channel stability. (realignment, encroachment, etc.)

Slope/Surface Protection Systems, Checklist DPP-1, Parts 1 and 3

- Describe cut and fill requirements
- Describe existing and proposed slope conditions
- Describe the permanent erosion control strategy (plants, soils, mulch, blankets, establishment periods, etc.)
- Use Erosion Prediction Procedure to validate erosion control design (attach RUSLE2 Output as applicable)
- When required, provide date of approval of the Erosion Control Plan by Landscape Architecture and Maintenance
- Summarize any hard surfaces (rock blankets, paving)

Concentrated Flow Conveyance Systems, Checklist DPP-1, Parts 1 and 4

- Briefly describe the Concentrated Conveyance Systems to be implemented for this project

Preservation of Existing Vegetation, Checklist DPP-1, Parts 1 and 5

- Describe area(s) of clearing and grubbing identified and defined in the contract plans
- Describe area(s) that will be placed off-limits to the contractor, if applicable (e.g., ESA areas)
- Consider project changes to increase preservation or preserve/avoid critical areas such as floodplains, wetlands, problem soils, and steep slopes.

5. Proposed Permanent Treatment BMPs to be used on the Project

Summarize responses to Checklist T-1, Parts 1-10 in a short narrative. Use the bullets listed below as examples of information that should be described in the narrative. Note, not all of the information listed is required or available at each phase of a project. Information to be included will depend on the nature of the project and the site conditions.

- Identify type of Media Filter incorporated: Full Sedimentation Austin Sand Filter, Partial Sedimentation Austin Sand Filter or Delaware Sand Filter
- If an Austin Sand Filter is incorporated into project, identify if earthen configuration or lined
- Is pretreatment provided to capture sediment and litter?
- Quantify approximate tributary area of impervious surface per Media Filter
- Identify Water Quality Volume (WQV) treated per Media Filter
- Identify depth to groundwater
- Discuss local vector agency issues

Multi-Chambered Treatment Trains (MCTTs), Checklist T-1, Parts 1 and 9

- Are MCTTs incorporated into project? If not, explain reason why not feasible. If yes, list number of MCTTs, location(s), and total WQV treated.
- Quantify approximate tributary area of impervious surface per MCTT
- Identify Water Quality Volume (WQV) treated per MCTT
- Discuss local vector agency issues

Wet Basins, Checklist T-1, Parts 1 and 10

- Are Wet Basins incorporated into project? If not, explain reason why not feasible. If yes, list number of Wet Basins, location(s), and total WQV treated.
- Quantify approximate tributary area of impervious surface per Wet Basin
- Identify Water Quality Volume (WQV) treated per Wet Basin
- Identify soil type and permeability
- Document groundwater depth

6. Proposed Temporary Construction Site BMPs to be used on Project

Summarize the selected Construction Site BMPs in a Short Narrative. The narrative should also include any pertinent details from the strategy used for the implementation of Construction Site BMPs (e.g. specific project conditions, construction operations, etc.) and monitoring. It is understood that the level of detail discussed will be different at each phase of the project. Include a brief summary to how the BMPs were estimated.

- Identify those Construction Site BMPs that have been designated as separate Bid Line Items.
- Identify those Construction Site BMPs incorporated as a lump sum in the Construction Site Management Item.
- Identify project risk level. If Risk Level 2 or 3, then identify planned monitoring locations and activities.

- Identify if dewatering will be required during the construction of the project. Describe circumstances. (i.e. will a separate dewatering permit be needed?)
- Identify if active treatment systems (ATS) will be used for the site, or portions thereof.
- Document the coordination effort to get concurrence with Construction regarding the Construction Site BMP strategy and associated quantities (provide names of staff and date of meeting(s)). Attach a copy of the Construction Site BMP Consideration Form to the SWDR at PS&E.
- Develop an estimate of quantities and costs (for internal Caltrans use only) for Construction Site BMPs and monitoring as a part of the Storm Water BMP Cost Summary. Complete for each phase of the project.

7. Maintenance BMPs (Drain Inlet Stenciling)

Briefly describe locations where drain inlet stenciling is required, such as within cities, towns, and communities with populations of 10,000 or more, or within designated MS4 areas. Include any specific stencil types and names of contacts that recommended stencil types or locations.

Required Attachments

- Vicinity Map
- Evaluation Documentation Form (EDF)
- Construction Site BMP Consideration Form (required at PS&E only)
- RUSLE2 Summary Sheet, as applicable (required at PS&E only)
- Risk Level Determination Documentation
- Treatment BMP Summary Spreadsheets (required, if Treatment BMPs are incorporated into project, required at PS&E only)
- Quantities for Construction Site BMPs (required at PS&E only)
- Rainfall Erosivity Waiver, if applicable (required at PS&E)

Supplemental Attachments

Note: Supplement Attachments are to be supplied during the SWDR approval process; where noted, some of these items may only be required on a project-specific basis.

- Storm Water BMP Cost Summary
- BMP cost information from: Project Planning Cost Estimate (PPCE) during PID and PA/ED project phases; Preliminary Engineer's Cost Estimate (PECE) for PS&E project phase
- Plans showing BMP Deployment (i.e. Layout Sheets, Drainage Sheets, Water Pollution Control Sheets, etc)



If Yes, consider **Gross Solids Removal Devices (GSRDs)**, complete and attach **Part 6** of this checklist. Note: Infiltration Devices, Detention Devices, Media Filters, MCTTs, and Wet Basins also can capture litter. Before considering GSRDs for stand-alone installation or in sequence with other BMPs, consult with District/Regional NPDES Storm Water Coordinator to determine whether Infiltration Devices, Detention Devices, Media Filters, MCTTs, and Wet Basins should be considered instead of GSRDs to meet litter/trash TMDL.

4. Is project located in an area (e.g., mountain regions) where traction sand is applied more than twice a year? ☐ Yes ☐ No

If Yes, consider **Traction Sand Traps**, complete and attach **Part 7** of this checklist.

5. Maximizing Biofiltration Strips and Swales

Objectives:

- 1) Quantify infiltration from biofiltration alone
- 2) Identify highly infiltrating biofiltration (i.e. > 90%) and skip further BMP consideration.
- 3) Identify whether amendments can substantially improve infiltration.

- (a) Have biofiltration strips and swales been designed for runoff from all project areas, including sheet flow and concentrated flow conveyance? If no, document justification in Section 5 of the SWDR. ☐ Yes ☐ No

(b) Based on site conditions, estimate what percentage of the WQV¹ can be infiltrated. When calculating the WQV, use a 12-hour drawdown for Type A and B soils, a 24-hour drawdown for Type C soils, and a 48-hour drawdown for Type D soils.

- ☐ < 20%
☐ 20 % - 50%
☐ 50% - 90%
☐ > 90%

☐ Complete

- (c) Is infiltration greater than 90 percent? If Yes, skip to question 13. ☐ Yes ☐ No

¹ A complete methodology for determining WQV infiltration is available at:
<http://www.dot.ca.gov/hq/oppd/stormwtr/index.htm>

- (d) Can the infiltration ranking in question 5(b) above be increased by using soil amendments? Use the 'drain time' associated with the amended soil (the 12-hour WQV for Type A and B soils, the 24-hour WQV for Type C soils¹). ☐Yes ☐No

If Yes, consider including soil amendments; increasing the infiltration ranking allows more flexibility in the selection of BMPs (strips and swales will show performance comparable to other BMPs). Record the new infiltration estimate below:

___ < 20% (skip to 6)
___ 20 % - 50% (skip to 6)
___ 50% - 90% (skip to 6)
___ >90%

☐Complete

- (e) Is infiltration greater than 90 percent? If Yes, skip to question 13. ☐Yes ☐No

6. Biofiltration in Rural Areas

Is the project in a rural area (outside of urban areas that is covered under an NDPES Municipal Stormwater Permit²). If Yes proceed to question 13. ☐Yes ☐No

7. Estimating Infiltration for BMP Combinations

Objectives:

- 1) Identify high-infiltration biofiltration or biofiltration and infiltration BMP combinations and skip further BMP consideration.
- 2) If high infiltration is infeasible, then identify the infiltration level of all feasible BMP combinations for use in the subsequent BMP selection matrices

- (a) Has concentrated infiltration (i.e., via earthen basins or earthen filters) been prohibited? Consult your District/Regional Storm Water Coordinator and/or environmental documents. ☐Yes ☐No

If No proceed to 7 (b); if Yes skip to question 8 and do not consider earthen basin-type BMPs

¹ Type D soils are not expected where amendments are incorporated

² See pages 39 and 40 of the Fact Sheets for the CGP.

http://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/constpermits/wqo_2009_0009_factsheet.pdf

- (b) Assess infiltration of an infiltration BMP that is used in conjunction with biofiltration. Include infiltration losses from biofiltration, if biofiltration is feasible.

☐ Complete

(use 24 hr WQV)

- ☐ < 20% (do not consider this BMP combination)
☐ 20% - 50%
☐ 50% - 90%
☐ >90%

Is at least 90 percent infiltration estimated? If Yes proceed to 13. If No proceed to 7(c).

☐ Yes ☐ No

- (c) Assess infiltration of biofiltration with combinations with remaining approved earthen BMPs using water quality volumes based on the drain time of those BMPs. This assessment will be used in subsequent BMP selection matrices.

Earthen Detention Basin
(use 48 hr WQV)

- ☐ < 20%
☐ 20% - 50%
☐ > 50%

Earthen Austin SF
(use 48 hr WQV)

- ☐ < 20%
☐ 20% - 50%
☐ > 50%

☐ Complete

Continue to Question 8

8. Identifying BMPs based on the Target Design Constituents

- (a) Does the project discharge to a water body that has been placed on the 303-d list or has had a TMDL adopted? If "No," use Matrix A to select BMPs, consider designing to treat 100% of the WQV, then skip to question 12.

☐ Yes ☐ No

If Yes, is the identified pollutant(s) considered a Targeted Design Constituent (TDC) (check all that apply below)?

- | | |
|-------------------------------------|---|
| <input type="checkbox"/> sediments | <input type="checkbox"/> copper (dissolved or total) |
| <input type="checkbox"/> phosphorus | <input type="checkbox"/> lead (dissolved or total) |
| <input type="checkbox"/> nitrogen | <input type="checkbox"/> zinc (dissolved or total) |
| | <input type="checkbox"/> general metals (dissolved or total) ¹ |

- (b) Treating Sediment. Is sediment a TDC? If Yes, use Matrix A to select BMPs, then skip to question 12. Otherwise, proceed to question 9.

☐ Yes ☐ No

¹ General metals include cadmium, nickel, chromium, and other trace metals. Note that selenium and arsenic are not metals. Mercury is a metal, but is considered later during BMP selection, under Question 12 below.

BMP Selection Matrix A: General Purpose Pollutant Removal			
Consider approaches to treat the remaining WQV with combinations of the BMPs in this table. The PE should select at least one BMP for the project; preference is for Tier 1 BMPs, followed by Tier 2 BMPs when Tier 1 BMPs are not feasible. Within each Tier, BMP selection will be determined by the site-specific determination of feasibility (Section 2.4.2.1). BMPs are chosen based on the infiltration category determined in question 7. BMPs in other categories should be ignored.			
	BMP ranking for infiltration category:		
	Infiltration < 20%	Infiltration 20% - 50%	Infiltration > 50%
Tier 1	Strip: HRT > 5 Austin filter (concrete) Austin filter (earthen) Delaware filter MCTT Wet basin	Austin filter (earthen) Detention (unlined) Infiltration basins* Infiltration trenches* Biofiltration Strip	Austin filter (earthen) Detention (unlined) Infiltration basins* Infiltration trenches* Biofiltration Strip Biofiltration Swale
Tier 2	Strip: HRT < 5 Biofiltration Swale Detention (unlined)	Austin filter (concrete) Delaware filter Biofiltration Swale MCTT Wet basin	Austin filter (concrete) Delaware filter MCTT Wet basin
<p>HRT = hydraulic residence time (min)</p> <p>*Infiltration BMPs that infiltrate the water quality volume were considered previously, so only undersized infiltration BMPs or hybrid designs are considered where infiltration is less than 90% of the water quality volume.</p>			

9. Treating both Metals and Nutrients.

Is copper, lead, zinc, or general metals *AND* nitrogen or phosphorous a TDC? If Yes use Matrix D to select BMPs, then skip to question 12. Otherwise, proceed to question 10.

☐ Yes ☐ No

10. Treating Only Metals.

Are copper, lead, zinc, or general metals listed TDCs? If Yes use Matrix B below to select BMPs, and skip to question 12. Otherwise, proceed to question 11.

☐ Yes ☐ No

BMP Selection Matrix B: Any metal is the TDC, but not nitrogen or phosphorous			
Consider approaches to treat the remaining WQV with combinations of the BMPs in this table. The PE should select at least one BMP for the project; preference is for Tier 1 BMPs, followed by Tier 2 BMPs when Tier 1 BMPs are not feasible. Within each Tier, BMP selection will be determined by the site-specific determination of feasibility (Section 2.4.2.1). BMPs are chosen based on the infiltration category determined in question 7. BMPs in other categories should be ignored.			
	BMP ranking for infiltration category:		
	Infiltration < 20%	Infiltration 20% - 50%	Infiltration > 50%
Tier 1	MCTT Wet basin Austin filter (earthen) Austin filter (concrete) Delaware filter	Austin filter (earthen) Detention (unlined) Infiltration basins* Infiltration trenches* MCTT Wet basin	Austin filter (earthen) Detention (unlined) Infiltration basins* Infiltration trenches* MCTT Biofiltration Strip Biofiltration Swale Wet basin
Tier 2	Strip: HRT > 5 Strip: HRT < 5 Biofiltration Swale Detention (unlined)	Austin filter (concrete) Delaware filter Biofiltration Strip Biofiltration Swale	Austin filter (concrete) Delaware filter
HRT = hydraulic residence time (min) *Infiltration BMPs that infiltrate the water quality volume were considered previously, so only undersized infiltration BMPs or hybrid designs are considered where infiltration is less than 90% of the water quality volume.			

11. Treating Only Nutrients.

Are nitrogen and/or phosphorus listed TDCs? If "Yes," use Matrix C to select BMPs. If "No", please check your answer to 8(a). At this point one of the matrices ☐ Yes ☐ No should have been used for BMP selection for the TDC in question, unless no BMPs are feasible.

BMP Selection Matrix C: Phosphorous and / or nitrogen is the TDC, but no metals are the TDC			
Consider approaches to treat the remaining WQV with combinations of the BMPs in this table. The PE should select at least one BMP for the project; preference is for Tier 1 BMPs, followed by Tier 2 BMPs when Tier 1 BMPs are not feasible. Within each Tier, BMP selection will be determined by the site-specific determination of feasibility (Section 2.4.2.1). BMPs are chosen based on the infiltration category determined in question 7. BMPs in other categories should be ignored.			
	BMP ranking for infiltration category:		
	Infiltration < 20%	Infiltration 20% - 50%	Infiltration > 50%
Tier 1	Austin filter (earthen) Austin filter (concrete) Delaware filter**	Austin filter (earthen) Detention (unlined) Infiltration basins* Infiltration trenches*	Austin filter (earthen) Detention (unlined) Infiltration basins* Infiltration trenches* Biofiltration Strip Biofiltration Swale
Tier 2	Wet basin Biofiltration Strip Biofiltration Swale Detention (unlined)	Austin filter (concrete) Delaware filter Biofiltration Strip Biofiltration Swale Wet basin	Austin filter (concrete) Delaware filter Wet basin
* Infiltration BMPs that infiltrate the water quality volume were considered previously, so only undersized infiltration BMPs or hybrid designs are considered where infiltration is less than 90% of the water quality volume.			
** Delaware filters would be ranked in Tier 2 if the TDC is nitrogen only, as opposed to phosphorous only or both nitrogen and phosphorous.			

BMP Selection Matrix D: Any metal, plus phosphorous and / or nitrogen are the TDCs			
<p>Consider approaches to treat the remaining WQV with combinations of the BMPs in this table. The PE should select at least one BMP for the project; preference is for Tier 1 BMPs, followed by Tier 2 BMPs when Tier 1 BMPs are not feasible. Within each Tier, BMP selection will be determined by the site-specific determination of feasibility (Section 2.4.2.1). BMPs are chosen based on the infiltration category determined in question 7. BMPs in other categories should be ignored.</p>			
	BMP ranking for infiltration category:		
	Infiltration < 20%	Infiltration 20% - 50%	Infiltration > 50%
Tier 1	Wet basin* Austin filter (earthen) Austin filter (concrete) Delaware filter**	Wet basin* Austin filter (earthen) Detention (unlined) Infiltration basins*** Infiltration trenches***	Wet basin* Austin filter (earthen) Detention (unlined) Infiltration basins*** Infiltration trenches*** Biofiltration Strip Biofiltration Swale
Tier 2	Biofiltration Strip Biofiltration Swale Detention (unlined)	Austin filter (concrete) Delaware filter Biofiltration Strip Biofiltration Swale	Austin filter (concrete) Delaware filter
* The wet basin should only be considered for phosphorus			
** In cases where earthen BMPs can infiltrate, Delaware filters are ranked in Tier 2 if the TDC is nitrogen only, but they are Tier 1 for phosphorous only or both nitrogen and phosphorous.			
*** Infiltration BMPs that infiltrate the water quality volume were considered previously, so only undersized infiltration BMPs or hybrid designs are considered where infiltration is less than 90% of the water quality volume.			

12. Does the project discharge to a waterbody that has been placed on the 303-d list or has had a TMDL adopted for mercury or low dissolved oxygen? ☐Yes ☐No
If Yes contact the District/Regional NPDES Storm Water Coordinator to determine if standing water in a Delaware filter, wet basin, or MCTT would be a risk to downstream water quality.
13. After completing the above, identify and attach the checklists shown below for every Treatment BMP under consideration. (use one checklist every time the BMP is considered for a different drainage within the project) ☐Complete
____ Biofiltration Strips and Biofiltration Swales: Checklist T-1, Part 2
____ Dry Weather Diversion: Checklist T-1, Part 3
____ Infiltration Devices: Checklist T-1, Part 4
____ Detention Devices: Checklist T-1, Part 5
____ GSRDs: Checklist T-1, Part 6
____ Traction Sand Traps: Checklist T-1, Part 7
____ Media Filter [Austin Sand Filter and Delaware Filter]: Checklist T-1, Part 8
____ Multi-Chambered Treatment Train: Checklist T-1, Part 9
____ Wet Basins: Checklist T-1, Part 10
14. Estimate what percentage of WQV (or WQF, depending upon the Treatment BMP selected) will be treated by the preferred Treatment BMP(s): _____% ☐Complete
- (a) Have Treatment BMPs been considered for use in parallel or series to increase this percentage? ☐Yes ☐No
15. Estimate what percentage of the net WQV (for all new impervious surfaces within the project) that will be treated by the preferred treatment BMP(s): _____% ☐Complete
16. Prepare cost estimate, including right-of-way, and site specific determination of feasibility (Section 2.4.2.1) for selected Treatment BMPs and include as supplemental information for SWDR approval. ☐Complete

Treatment BMPs

Checklist T-1, Part 3

Prepared by: _____ Date: _____ District-Co-Route: _____

PM : _____ Project ID (or EA): _____ RWQCB: _____

Dry Weather Flow Diversion

Feasibility

1. Is a Dry-Weather Flow Diversion acceptable to a Publicly Owned Treatment Works (POTW)? ☐ Yes ☐ No
2. Would a connection require ordinary (i.e., not extraordinary) plumbing, features or construction methods to implement? ☐ Yes ☐ No
 If "No" to either question above, Dry Weather Flow Diversion is not feasible.
3. Does adequate area exist within the right-of-way to place Dry Weather Flow Diversion devices? ☐ Yes ☐ No
 If "Yes", continue to Design Elements sections. If "No", continue to Question 4.
4. If adequate area does not exist within right-of-way, can suitable, additional right-of-way be acquired to site Dry Weather Flow Diversion devices and how much right-of-way would be needed? _____ (acres) ☐ Yes ☐ No
 If "Yes", continue to the Design Elements section.
 If "No", continue to Question 5.
5. If adequate area cannot be obtained, document in Section 5 of the SWDR that the inability to obtain adequate area prevents the incorporation of this Treatment BMP into the project. ☐ Complete

Design Elements

*** Required** Design Element – A "Yes" response to these questions is required to further the consideration of this BMP into the project design. Document a "No" response in Section 5 of the SWDR to describe why this Treatment BMP cannot be included into the project design.

**** Recommended** Design Element – A "Yes" response is preferred for these questions, but not required for incorporation into a project design.

1. Does the existing sanitary sewer pipeline have adequate capacity to accept project dry weather flows, or can an upgrade be implemented to handle the anticipated dry weather flows within the project's budget and objectives? * ☐ Yes ☐ No
2. Can the connection be designed to allow for Maintenance vehicle access? * ☐ Yes ☐ No
3. Can gate, weir, or valve be designed to stop diversion during storm events? * ☐ Yes ☐ No
4. Can the inlet be designed to reduce chances of clogging the diversion pipe or channel? * ☐ Yes ☐ No
5. Can a back flow prevention device be designed to prevent sanitary sewage from entering storm drain? * ☐ Yes ☐ No

Treatment BMPs

Checklist T-1, Part 4

Prepared by: _____ Date: _____ District-Co-Route: _____

PM : _____ Project ID (or EA): _____ RWQCB: _____

Infiltration Devices

Feasibility

1. Does local Basin Plan or other local ordinance provide influent limits on quality of water that can be infiltrated, and would infiltration pose a threat to groundwater quality? ☐ Yes ☐ No
2. Does infiltration at the site compromise the integrity of any slopes in the area? ☐ Yes ☐ No
3. Per survey data or U.S. Geological Survey (USGS) Quad Map, are existing slopes at the proposed device site >15%? ☐ Yes ☐ No
4. At the invert, does the soil type classify as NRCS Hydrologic Soil Group (HSG) D, or does the soil have an infiltration rate < 0.5 inches/hr? ☐ Yes ☐ No

5. Is site located over a previously identified contaminated groundwater plume? ☐ Yes ☐ No
If "Yes" to any question above, Infiltration Devices are not feasible; stop here and consider other approved Treatment BMPs.

6. (a) Does site have groundwater within 10 ft of basin invert? ☐ Yes ☐ No
(b) Does site investigation indicate that the infiltration rate is significantly greater than 2.5 inches/hr? ☐ Yes ☐ No

If "Yes" to either part of Question 6, the RWQCB must be consulted, and the RWQCB must conclude that the groundwater quality will not be compromised, before approving the site for infiltration.

7. Does adequate area exist within the right-of-way to place Infiltration Device(s)? ☐ Yes ☐ No
If "Yes", continue to Design Elements sections. If "No", continue to Question 8.
8. If adequate area does not exist within right-of-way, can suitable, additional right-of-way be acquired to site Infiltration Devices and how much right-of-way would be needed to treat WQV? _____ acres ☐ Yes ☐ No
If Yes, continue to Design Elements section.
If No, continue to Question 9.
9. If adequate area cannot be obtained, document in Section 5 of the SWDR that the inability to obtain adequate area prevents the incorporation of this Treatment BMP into the project. ☐ Complete

Feasibility- Delaware Filter

1. Is the volume of the Delaware Filter equal to at least the WQV using a 40 to 48 hour drawdown? (Note: the WQV must be $\geq 4,356 \text{ ft}^3$ [0.1 acre-feet], consult with District/Regional Design Storm Water Coordinator if a lesser volume is under consideration.) ☐ Yes ☐ No
2. Is there sufficient hydraulic head to operate the device (minimum 3 ft between the inflow and outflow chambers)? ☐ Yes ☐ No
3. Would a permanent pool of water be allowed by the local vector control agency? Confirm that check valves and vector proof lid as shown on standard detail sheets will be allowed, is used. ☐ Yes ☐ No

If No to any question, then a Delaware Filter is not feasible

4. Does adequate area exist within the right-of-way to place a Delaware Filter(s)?
If Yes, continue to Design Elements sections. If No, continue to Question 5. ☐ Yes ☐ No
5. If adequate area does not exist within right-of-way, can suitable, additional right-of-way be acquired to site the device and how much right-of way would be needed to treat WQV? _____ acres ☐ Yes ☐ No
If Yes, continue to the Design Elements section. If No, continue to Question 6.
6. If adequate area cannot be obtained, document in Section 5 of the SWDR that the inability to obtain adequate area prevents the incorporation of this Treatment BMP into the project. ☐ Complete
7. Does the project discharge to a waterbody that has been placed on the 303-d list or has had a TMDL adopted for bacteria, mercury, sulfides, or low dissolved oxygen? ☐ Yes ☐ No

If yes, contact the Regional/District NPDES Storm Water Coordinator to determine if standing water in this treatment BMP would be a risk to downstream water quality. If standing water is a potential issue, consider use of another treatment BMP.

If a Delaware Filter is still under consideration, continue to the Design Elements – Delaware Filter section.

Design Elements – Austin Sand Filter

* **Required** Design Element – A “Yes” response to these questions is required to further the consideration of this BMP into the project design. Document a “No” response in Section 5 of the SWDR to describe why this Treatment BMP cannot be included into the project design.

** **Recommended** Design Element – A “Yes” response is preferred for these questions, but not required for incorporation into a project design.

- | | | |
|--|------------------------------|-----------------------------|
| 1. Is the drawdown time of the 2 nd chamber 24 hours? * | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 2. Is access for Maintenance vehicles provided to the Austin Sand Filter? * | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 3. Is a bypass/overflow provided for storms > WQV? * | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 4. Is the flow path length to width ratio for the sedimentation chamber of the “full” Austin Sand Filter $\geq 2:1$? ** | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 5. Can pretreatment be provided to capture sediment and litter in the runoff (such as using vegetation)? ** | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 6. Can the Austin Sand Filter be placed using an earthen configuration? **
If No, go to Question 9. | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 7. Is the Austin Sand Filter invert separated from the seasonally high groundwater table by ≥ 10 ft)? *
If No, design with an impermeable liner. | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 8. Are side slopes of the earthen chamber 3:1 (h:v) or flatter? * | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 9. Is maximum depth ≤ 13 ft below ground surface? * | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10. Can the Austin Sand Filter be placed in an offline configuration? ** | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

Design Elements – Delaware Filter

*** Required** Design Element – A “Yes” response to these questions is required to further the consideration of this BMP into the project design. Document a “No” response in Section 5 of the SWDR to describe why this Treatment BMP cannot be included into the project design.

**** Recommended** Design Element – A “Yes” response is preferred for these questions, but not required for incorporation into a project design.

- | | | |
|---|------------------------------|-----------------------------|
| 1. Is the drawdown time of the 2 nd chamber between 40 and 48 hours, typically 40-48 hrs? * | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 2. Is access for Maintenance vehicles provided to the Delaware Filter? * | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 3. Is a bypass/overflow provided for storms > WQV? ** | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 4. Can pretreatment be provided to capture sediment and litter in the runoff (such as using vegetation)? ** | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 5. Is maximum depth ≤ 13 ft below ground surface? * | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

Treatment BMPs

Checklist T-1, Part 9

Prepared by: _____ Date: _____ District-Co-Route: _____

PM : _____ Project ID (or EA): _____ RWQCB: _____

MCTT (Multi-chambered Treatment Train)

Feasibility

1. Is the proposed location for the MCTT located to serve a “critical source area” (i.e. vehicle service facility, parking area, paved storage area, or fueling station)? ☐ Yes ☐ No
2. Is the WQV $\geq 4,346 \text{ ft}^3$ [0.1 acre-foot]? ☐ Yes ☐ No
3. Is there sufficient hydraulic head (typically ≥ 6 feet) to operate the device? ☐ Yes ☐ No
4. Would a permanent pool of water be allowed by the local vector control agency? ☐ Yes ☐ No
Confirm that check valves and vector proof lid as shown on standard detail sheets be allowed.

If No to any question above, then an MCTT is not feasible.

5. Does adequate area exist within the right-of-way to place an MCTT(s)? ☐ Yes ☐ No
If Yes, continue to Design Elements sections. If No, continue to Question 6.
6. If adequate area does not exist within right-of-way, can suitable, additional right-of-way be acquired to site the device and how much right-of way would be needed to treat WQV? _____ acres ☐ Yes ☐ No
If Yes, continue to Design Elements section. If No, continue to Question 7.
7. If adequate area cannot be obtained, document in Section 5 of the SWDR that the inability to obtain adequate area prevents the incorporation of this Treatment BMP into the project. ☐ Complete
8. Does the project discharge to a waterbody that has been placed on the 303-d list or has had a TMDL adopted for bacteria, mercury, sulfides, low dissolved oxygen, or odors? ☐ Yes ☐ No

If yes, contact the Regional/District NPDES Storm Water Coordinator to determine if standing water in this treatment BMP would be a risk to downstream water quality. If standing water is a potential issue, consider use of another treatment BMP.

Construction Site BMPs**Checklist CS-1, Part 4**

Prepared by: _____ Date: _____ District-Co-Route: _____

PM : _____ Project ID (or EA): _____ RWQCB: _____

Wind Erosion ControlsWind Erosion Control (WE-1)

1. Is the project located in an area where standard dust control practices in accordance with Standard Specifications, Section 10: Dust Control, are anticipated to be inadequate during construction to prevent the transport of dust offsite by wind? *(Note: Dust control by water truck application is paid for through the various items of work. Dust palliative, if it is included, is paid for as a separate item.)* ☐ Yes ☐ No
- (a) Select SS-3 (Hydraulic Mulch), SS-4 (Hydroseeding), SS-5 (Soil Binders), SS-7 (Geotextiles, Mats, Plastic Covers, and Erosion Control Blankets), SS-8 (Wood Mulching) or a combination to cover the DSA subject to wind erosion year-round, especially when significant wind and dry conditions are anticipated during project construction. (Coordinate with District Construction for selection and preference of wind erosion control BMPs.) ☐ Complete
- (b) Designate as a separate contract bid line item. ☐ Complete



Construction Site BMPs**Checklist CS-1, Part 5**

Prepared by: _____ Date: _____ District-Co-Route: _____

PM : _____ Project ID (or EA): _____ RWQCB: _____

Non-Storm Water ManagementTemporary Stream Crossing (NS-4) & Clear Water Diversion (NS-5)

1. Will construction activities occur within a waterbody or watercourse such as a lake, wetland, or stream? (Coordinate with District Construction for selection and preference for stream crossing and clear water diversion BMPs.) ☐ Yes ☐ No
- (a) Select from types offered in NS-4 (Temporary Stream Crossing) to provide access through watercourses consistent with permits and agreements.¹ ☐ Complete
- (b) Select from types offered in NS-5 (Clear Water Diversion) to divert watercourse consistent with permits and agreements.¹ ☐ Complete
- (c) Designate as a separate contract bid line item(s). ☐ Complete

Other Non-Storm Water Management BMPs

2. Are construction activities anticipated that will generate wastes or residues with the potential to discharge pollutants? ☐ Yes ☐ No
- (a) Identify potential pollutants associated with the anticipated construction activity and select the corresponding BMP such as NS-1 (Water Conservation Practices), NS-2 (Dewatering Operations), NS-3 (Paving and Grinding Operations), NS-7 (Potable Water/Irrigation), NS-8 (Vehicle and Equipment Cleaning), NS-9 (Vehicle and Equipment Fueling), NS-10 (Vehicle and Equipment Maintenance), NS-11 (Pile Driving Operations), NS-12 (Concrete Curing), NS-13 (Material and Equipment Use Over Water), NS-14 (Concrete Finishing), and NS-15 (Structure Demolition/Removal Over or Adjacent to Water).¹ ☐ Complete
- (b) Verify that costs for non-stormwater management BMPs are identified in the contract documents. Designate BMP as a separate contract bid line item if the requirements in Construction Site Management (SSP 07-346) are anticipated to be inadequate or if requested by Construction. ☐ Complete

¹ Coordinate with District Environmental for consistency with US Army Corps of Engineers 404 and 401 permits and Dept. of Fish and Game 1601 Streambed alteration Agreements.

Table F-6. Construction Site Water Pollution Control		
a) Total Construction Cost	Prepare SWPPP	Prepare WPCP
\$0 to \$500,000	\$2,200 + RQM	\$1,000
\$500,000 to \$1,000,000	\$2,700 + RQM	\$1,100
\$1,000,000 to \$1,500,000	\$2,800 + RQM	\$1,100
\$1,500,000 to \$12,000,000	\$3,200 + RQM	\$1,200
Greater than \$12,000,000	\$6,000 + RQM	-

Note: Information derived from 2009 average bid costs using Caltrans Cost Database with an additional mark-up to account for qualified developers of the SWPPP.

Routine Quarterly Non-Storm Water Monitoring (RL 1, 2, and 3): All projects required to develop a SWPPP regardless of the RL are to conduct quarterly, non-storm water monitoring and storm-triggered visual monitoring. To develop cost estimates for routine, quarterly, non-storm water monitoring, equation 1 (Eqn. 1) below should be used. The costs for storm-triggered visual monitoring is assumed to already be included in the costs for preparing a SWPPP, as this was already a Caltrans requirement prior to the development of the new CGP.

The cost of routine, quarterly monitoring (RQM) for non-storm water discharges is a function of the project duration, the drainage area, and the cost per inspection, and can be estimated using Equation 1 as follows:

$$\text{RQM Cost} = (\text{months}/3 + 1) \times (N + 4) \times \text{Labor} \quad (\text{Eqn. 1})$$

where:

Months = the number of months the project will be occurring, including from initial site work through the construction until soil is completely stabilized after construction. This is used to estimate the number of required quarterly inspections.

N = calculated number of discharge locations. It is assumed that each discharge area can be reviewed within 1 hour. An additional 4 hours is provided to account for the time required to complete reporting and follow-up.

Labor = estimated hourly labor rate for a qualified inspector. Assume \$100 per hour is appropriate.

Construction Site Management (BEES Item: 074016)

Examine local BEES bid history to estimate costs for Construction Site Management (SSP 07-346). Coordinate cost estimate with Construction.

Rain Event Action Plan (BEES Item: 074056)

All RL 2 and RL 3 projects are to implement a Rain Event Action Plan (REAP) in advance of a forecasted storm. The contractor evaluates site readiness as part of formulating a REAP. This contract item is non-adjustable.

The PE is to set aside \$500 for each REAP that is anticipated to be prepared by the construction contractor. To determine the number of days, use the mean number of days reported for precipitation producing greater than or equal to 0.1 inches for the duration of the project. Use climate data from a nearby representative station identified in the Water Quality Planning Tool or published by the National Climatic Data Center of the National Oceanic Atmospheric Association at:

(http://cdo.ncdc.noaa.gov/climate_normals/clim20/state-pdf/ca.pdf).

Storm Water Annual Report (BEES Item: 074057)

In order to account for the submittal of an annual report to the RWQCB regarding project compliance with the CGP, the PE should set aside \$2,000 for each year of construction. This contract item is non-adjustable.

Storm Water Sampling and Analysis Day (BEES Item: 074058)

Storm Water Sampling and Analysis (monitoring) costs have become more discernable due to new requirements of the CGP; consequently, the cost is to be associated with a unit price in the PS&E. Monitoring costs for compliance with the CGP can be estimated using the procedures and equations described below. Be sure to use only those procedures applicable to the RL of the project and the associated representative number of rain days. This contract item is non-adjustable.

The estimating procedure outlined below accounts for sampling and analysis costs based primarily on the precipitation characteristics, discharge locations, and construction duration of the project. The sections below outline the types of sampling and analysis required for different RL 2 and RL 3 projects and how to develop associated cost estimates.

Storm Water Monitoring for pH and Turbidity: Sampling and analysis of storm water runoff for pH and turbidity is required at all RL 2 and RL 3 projects. At a minimum, 3 samples must be collected per day of qualifying storm events, which are those producing precipitation of 0.5-inch or more at the time of discharge.

The cost of storm water monitoring (SWM) is a function of the precipitation frequency, construction duration, and the number of sampling locations for the project, as well as the cost per sample. The SWM cost can be estimated using Equation 2 as follows:

$$\text{SWM Cost} = M \times \{[\text{Days}_{0.5"} \times \$1000] + \$2000 (1 + 0.1 (\text{Months}/12))\} \quad (\text{Eqn. 2})$$

where:

M = cost multiplier based on the number of anticipated discharge sampling points. When M = 1, the cost estimate assumes that up to 7 locations can be sampled by one fully equipped staff per event. Sites with 8 to 14 sampling locations assumes that one additional staff-day will be required, thus M=2. For sites with 15 – 21 sampling locations M=3, and so forth.

Days_{0.5"} = estimated number of days over project timeline with precipitation event greater than 0.5 inches. However, it is recommended that the difference between the mean number of days for both precipitation events greater than 0.5 inches and 0.1 inches be used. Use climate data from a nearby representative station identified in the Water Quality Planning Tool or published by the National Climatic Data Center of the National Oceanic Atmospheric Association at: (<http://cdo.ncdc.noaa.gov/climatenormals/clim20/state-pdf/ca.pdf>).

months = the number of months the project will be occurring, including from initial site work through the construction until the site is completely stabilized after construction.

\$1000 = daily cost to perform sampling and analysis, as well as reporting, using one staff at up to 7 discharge locations, excluding equipment.

\$2000 = purchase cost for field turbidimeter, pH meter, calibration solutions, rain gauge, and all ancillary sampling equipment. A maintenance and calibration estimate of 10% per year is included in the equation.

The cost of storm water sampling and analysis per day can be estimated using Equation 3 as follows:

$$\text{Storm Water Sampling and Analysis Day} = \text{SWM Cost} / \text{Days}_{0.5"} \quad (\text{Eqn. 3})$$

Receiving Water Bioassessment (RL 3)

Bioassessment monitoring in receiving waters is required for all RL 3 projects that have 30 acres or more of disturbed area and directly discharge into receiving waters impaired for sediment or listed with beneficial uses of COLD and SPAWN and MIGRATORY.

Bioassessment monitoring is required both upstream and downstream of the impacted area, and both before and after the project. The CGP contains an estimate of \$7,500 per sample for this type of work. To account for this work, a supplemental cost of \$30,000 should be added to all RL 3 projects that disturb 30 or more acres and directly discharge into the qualifying receiving waters.

F.6.4 Supplemental Costs**Stormwater Sampling and Analysis (BEES Item 066597)**

The Supplemental Work item for Stormwater Sampling and Analysis covers the cost of lab tests for water quality samples. Estimate this item using the same rate as for Prepare SWPPP less RQM.

Sampling and analysis for non-visible pollutants is not often required unless previous site contamination is present, or WPC practices are failing and result in a discharge. The number of samples, sampling frequency, and analytes for this type of monitoring is unpredictable for this reason. It is recommended to account for this work as a supplemental cost due to previous site contamination in coordination with the Hazardous Waste Coordinator and District NPDES Storm Water Coordinator.

Sampling and analysis for suspended sediment concentration (SSC) is only required at RL 3 sites with previous exceedances of the daily average turbidity NEL. The additional labor cost required to conduct this sampling would be minimal since this would occur concurrently with existing sampling for pH and turbidity, therefore the primary costs would be analytical and reporting. Analytical costs are typically \$100 per sample. Since the quantity of samples is unknown, as this is a function of an exceedance of the NEL at the project site, the PE should not assign any supplemental costs for this monitoring.

Receiving water quality monitoring is required only at RL 3 sites where exceedances of the NEL have occurred and there is a direct discharge to a receiving water. Since it is unknown whether exceedances will occur, this cost can not be predicted nor should it be accounted for as a supplemental cost.

Additional Water Pollution Control (BEES Item: 066596)

The Supplemental Work item for Additional Water Pollution Control will cover additional WPC BMPs suggested by the RE or Contractor. This change order work is expected to be minor for most projects. Estimate this item using the same rate as Prepare SWPPP, less RQM for SWPPP jobs. For WPCP jobs estimate at the same rate as Prepare WPCP.

Water Pollution Control Maintenance Sharing (BEES Item: 066595)

The Supplemental Work item for Water Pollution Control Maintenance Sharing still exists but has been shifted to the individual separate item BMPs that allow for cost sharing. Water Pollution Control Maintenance Sharing cost should be no lower than the amount estimated for Prepare SWPPP (or Prepare WPCP). The following may be used to estimate BMP maintenance costs based upon input from Districts where this approach was piloted. The aggregate total of estimated maintenance costs would be combined into item WPC Maintenance Sharing:

- Temporary Silt Fence, estimate at 10% of the separate item cost per rainy season.

- Temporary Fiber Roll, estimate at 10% of the separate item cost per rainy season.
- Temporary Erosion Control and other hydraulically applied soil stabilization BMPs, estimate at 10% of the separate item cost per rainy season.
- Temporary Gravel Bag Berm, estimate at 25% of the item cost per rainy season.
- Temporary Drainage Inlet Protection, estimate at 25% of the item cost per rainy season.
- Temporary Construction Entrance, estimate at 25% of the item cost per rainy season.

All other Separate Item BMPs

For the variety of separate contract item BMPs the Item Cost database on the OE website will be sufficient. The items mentioned previously are not tracked so other methods must be used as tools for guidance. Also refer to Table F-5 for individual BMP costs and Appendix C2 for estimating ATS.

F.7 STANDARD FORMAT FOR PROJECT PLANNING COST ESTIMATES

The standard format included at the end of the PDPM (Appendix AA) may be used for all project planning cost estimates. For many projects, the form can be used as is by completing a cover sheet and "filling-in" the blanks. However, if needed, extra lines are provided for items not listed. Additional lines may be added as necessary.

The standard format is broken into four components:

- Cover Sheet;
- Roadway Items;
- Structure Items; and
- Right-of-Way.

Although the standard format was not written specifically for estimating Storm Water BMPs, Sections 3 (Drainage) and 4 (Specialty Items) may be used for this purpose. The concept behind the standard format requires that the cost estimator determine quantities and costs for groups of related work as previously discussed in Sections F.1 through F.5 of this Project Planning and Design Guide (PPDG). Identification of contract items is not necessary (but would be beneficial) to obtain a realistic cost estimate for each viable project alternative. Calculation sheets, maps and sketches used to determine costs and quantities for the cost estimate should be retained in the project files until the project has been completed and finalized.

F.7.1 Drainage

Large drainage facilities (i.e., reinforced concrete boxes, etc.) should be estimated separately and the *Standard Plans* should be consulted for quantities. Drainage items for widening and rehabilitation projects can be estimated by determining extensions to existing

culverts and the number of other features, such as inlets, and overside drains, that will be affected. Be aware of any additional right-of-way that may be needed for drainage easements. Bid sheets from adjacent or similar type projects can be evaluated for estimating unit costs. Cost estimates for drainage on new alignment projects can be quantified by comparisons with similar types of projects.

F.7.2 Specialty Items

Items such as erosion control or slope protection (both during construction and permanent) can be estimated by using slope information obtained from the field review. Items such as hazardous wastes and environmental mitigation require consultation with other functional units in the District, the Engineering Service Center, and Headquarters. It is important to deal with hazardous waste and environmental issues immediately and design the project to avoid them, if possible, since they often adversely affect project cost estimates.

F.7.3 Right-of-Way Items

The right-of-way portion of the cost estimate should be obtained from the District Right-of-Way Branch. The Right-of-Way Branch prepares its cost estimate based on current procedures and guidelines contained in the *Right-of-Way Manual*. Costs for the listed right-of-way items are to be obtained from the Right-of-Way Data Sheet (see Appendix JJ of the PDPM). The Right-of-Way Data Sheet should be referred to in the project cost estimate as backup information.

"Construction Contract Work" (contractual obligations made by the Right-of-Way Branch with the property owner, such as the costs to relocate fencing, reconstruct gates, reconstruction of road approaches) should be described briefly and the estimated cost to perform this work given. The estimated cost should only be shown in this portion of the PPCE, not included. Construction contractual obligations are to be included in the project cost estimate as construction items of work.

F.7.4 Cost Estimate

Cost estimating summary sheets are available in Appendix AA of the PDPM. These sheets may be used to track estimates relating to costs for incorporating stormwater BMPs. The reader should refer to the PDPM for more specific guidance on using these forms.